

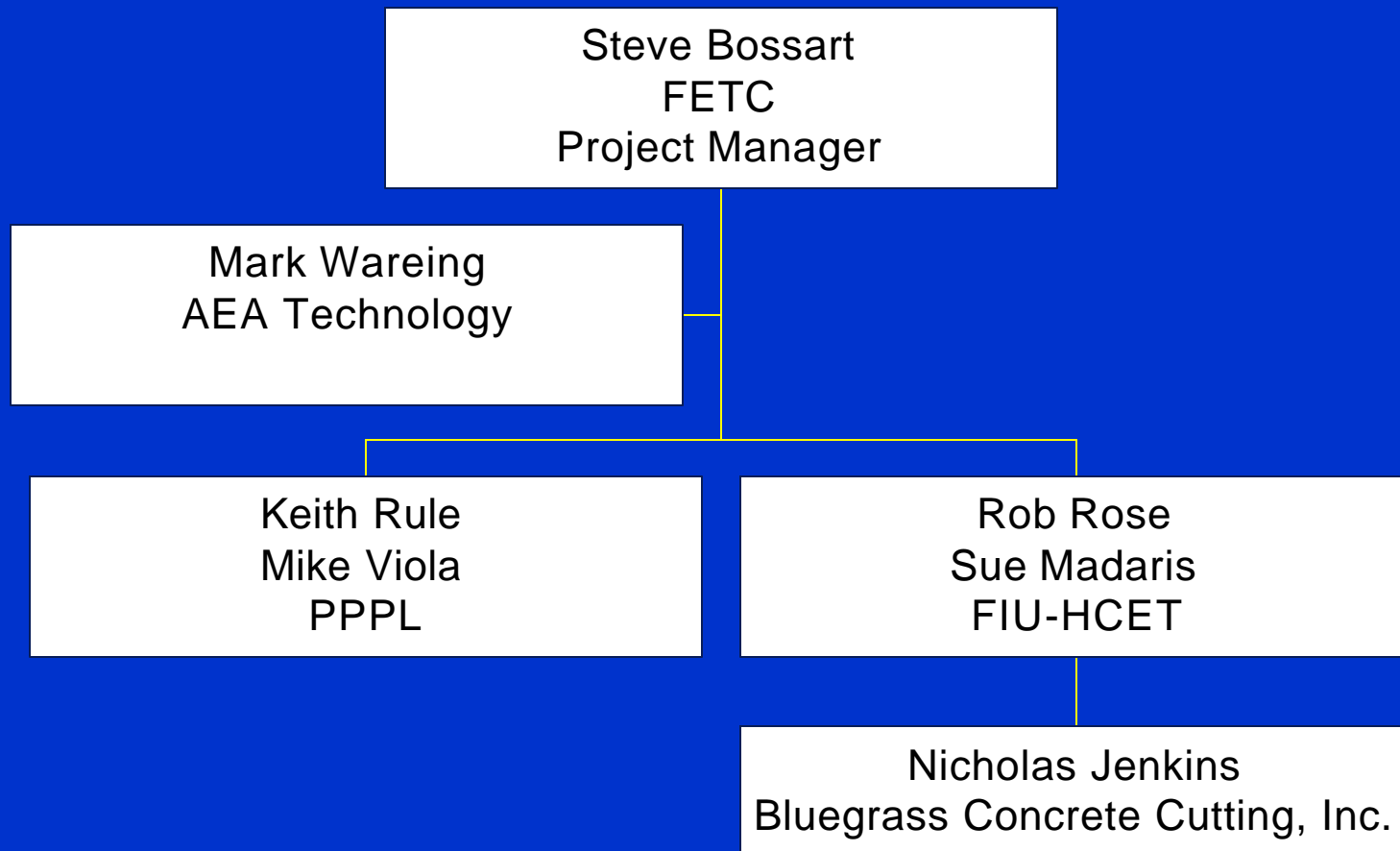
**Deactivation and Decommissioning Focus Area  
Mid-Year Review Meeting  
Federal Energy Technology Center**

**Diamond Wire Cutting  
Technology Assessment  
of  
Tokamak Fusion Test Reactor  
Vacuum Vessel Surrogate**

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# Project Organization



# Project Purpose

- Determine if existing diamond wire cutting methods and technology are suitable for cutting a surrogate section of the TFTR vacuum vessel.
- Determine if existing diamond wire cutting methods and technology are suitable for cutting other stainless steel devices that require D&D.
- Optimize the cooling methods.
  - Air emissions
  - waste generation
  - wire performance
- Optimize the void filling materials.
  - Shipping weight
  - stabilization of radionuclides
  - wire performance



# Scope

- Four surrogates of TFTR vacuum vessel filled with:  
Foam, low-density concrete, concrete, empty
- Using a new diamond wire, cut each surrogate using water cooling.
- Select the “best” void filler and cut this surrogate twice, using liquid nitrogen and air cooling.
- Select “best” cooling media and cut surrogate to completion.



# Technical Approach

- Fabricate VV surrogates, 90" in diameter using 1/2" 304 SS.
- Fabricate and install VV internals.
  - 1/2" and 5/8" thick 718 PH inconel
  - 1" thick 304 stainless steel
  - 1.5 " thick graphite tiles
- Fabricate support structure
- Fill three surrogates with selected void fillers
- Establish contamination controls for each method (gas and water)
- Perform demonstration using "wraparound" method.



# Schedule

- **Test Plan Development - Draft 3/3/99, Final - 5/24/99**
- **Procure vendor for DWC - BCCI awarded contract 3/15/99**
- **Design and construct surrogates**
  - **Design completed 4/9/99**
  - **Fabrication in progress 50% complete. Due- 6/18/99**
- **Fill surrogates with void fillers - 6/25/99**
- **Perform Demonstration - 7/26/99 - 8/6/99**
- **Prepare ITSr - 8/9/99 to 9/20/99**
- **Issue final report to DOE - 10/29/99**



# Applicability to Others

**PPPL: Vacuum pumping ducts**

**DOE - SRS heat exchangers, glove boxes**

**Test Reactors: Reactor vessels**

**Commercial reactors: Reactor vessels, Steam generators,  
pressure vessels**



# Benefits over Baseline

**Baseline - Plasma arc cutting, combined with remote disassembly.**

- \* *Significant air emissions - radiological and N<sub>2</sub>O*
- \* *Bubble suits for VV entry and/or remote handling (costly) to remove VV internals*
- \* *Limited ability to control tritium emissions*

**Diamond Wire cutting-**

- \* *Reduced emissions - no N<sub>2</sub>O, radionuclides only in cut location*
- \* *No need to remove VV internals*
- \* *Void filler stabilizes radionuclides, provides shielding, and provides structural stability during cutting*
- \* *Reduced personnel exposure - remote operation, no entry*
- \* *Reduced cost - 2 million versus expected cost of \$400K*
- \* *Places VV in preferred waste form for burial*





# Cost Evaluation Criteria

- **Mobilization -**
  - Equipment set-up, tenting, ventilation, cooling media, void filling
  - Utilities, training, transportation, permitting.
- **Dismantlement of TFT R Vacuum Vessel -**
  - Vendor rate, production rate, consumables and PPE
  - Site labor, site monitoring, and safety costs
- **Demobilization -**
  - Decontaminate and disassemble equipment, survey, load, and transport
  - Collect consumable items for disposition, disassemble temporary structures
- **Waste Management -**
  - Treat liquid wastes and dispose of in accordance with burial site requirements
  - Characterize, package and transport solid wastes for disposal



# Technical Evaluations

- Effects of Required PPE - noise, respiratory, clothing, eye and other as specified.
- Consumption of cooling media and associated air emissions
- Cost and performance of diamond wire
- Cutting rate
- Wire replacement and dimension
- Effects of wrap-around technique
- DWC Equipment performance and specifications
- Secondary waste generation
- Personnel exposure - time in area, distance from source, shielding from filler.



# Progress

- **Void filler specifications - In progress, Due 5/28**
  - **wire performance, structural and stability specs.**
- **Baseline data for comparison - AEA and FIU researching**
- **Surrogate - recovered on-site materials, fabrication is in progress**
- **Cooling media - details in progress**
  - **water**
  - **air**
  - **liquid N2**



# Demonstration

- Scheduled for July 26 start at PPPL
- Will be performed inside fabrication facility
- No restrictions for facility access
- FIU and PPPL will collect data
- BCCI to perform actual cutting
- Cutting estimated to take 7-8 days



# Path Forward

- Fabrication is on schedule
- Procurement of cooling media and void fillers are in progress
- No outstanding technical issues
- Obtaining baseline data is critical
- Vendor awarded additional \$5K to demonstrate proprietary liquid N2 cooling technique
- Teamwork has been key to current progress

